| Projek Code : | BAXU 3923 |
|---|---|

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA
## FACULTY OF ARTIFICIAL INTELLIGENCE AND CYBER SECURITY

## WORKSHOP 2
## PROPOSAL FORM

**A**

**GROUP NO:** 15

**TITLE OF PROPOSED PROJECT:** Intelligent Crop Disease Detection System Using Deep Learning

*Tajuk projek yang dicadangkan :*

**B** **DETAILS OF STUDENT** / *MAKLUMAT PELAJAR*

**B(i)**

| No | Name of Student | Matric No | E-mail Address |
|---|---|---|---|
| 1 | Elango A/L Vellasamy | B032310233 | b032310233@student.utem.edu.my |
| 2 | Yew Zhi Yu | B032310595 | b032310595@student.utem.edu.my |
| 3 | Muhammad Faiz bin Mohd Salleh | B032420081 | b032420081@student.utem.edu.my |
| 4 | Abdulaziz Ali Salem Awadh | B032310888 | b032310888@student.utem.edu.my |

**B(ii)** **Course:**
*Kursus:*

■ BITI/BAXI ☐ BITZ/BAXZ

**C** **PROJECT INFORMATION** / *MAKLUMAT PROJEK*

**C(i)** **Executive Summary of Project Proposal (maximum 300 words)**
**(Please include the background of project, problem statements, objectives, scope and project significance from the project)**

*Ringkasan Cadangan Eksekutif Projek (maksima 300 patah perkataan)*
*(Meliputi latar belakang projek, penyataan masalah, objektif dan kepentingan projek)*

The agricultural sector of Malaysia faces severe threats from plant diseases which result in substantial crop damage and diminished food availability. The lack of disease detection expertise among farmers forces them to perform unreliable manual inspections which require extensive labor. The proposed Intelligent Crop Disease Detection System based on deep learning technology enables mobile device users to identify plant diseases

| | |
|---|---|
| | quickly and precisely.<br><br>The system enables farmers to identify plant diseases through smartphone plant image capture which produces instant diagnostic results and treatment advice for their agricultural needs. Our solution employs Convolutional Neural Networks (CNN) with image segmentation techniques to achieve 95–98% accuracy according to research findings.<br><br>Project Objective: The goal is to create an AI-based mobile app that accurately identifies and classifies plant diseases with at least 85% accuracy. In pursuit of this goal, image preprocessing and segmentation, training a CNN with transfer learning, building a mobile application with an intuitive interface, and presenting feasible treatment options will all be accomplished.<br><br>Scope: The complete system consists of three important modules: (1) Image Capture and Preprocessing which Enhancement and segmentation Image Capture and Preprocessing and (2) Disease Detection Engine which uses CNN with transfer learning and (3) Results and recommendations which gives disease identification, confidence scores, and treatment recommendations. The intended users are farmers in Malaysia, agricultural officers, and members of the farming community.<br><br>Significance: This system reduces agricultural losses, increases farmer's productivity, and improves food security which means that it impacts agriculture in Malaysia positively. The system also allows any farmer to access complex disease diagnosis using artificial intelligence irrespective of location or financial resources. The documented research and the ease of commercialization (1,420+ citations) makes this system an example of an advanced AI technology that serves social purpose. The system helps address important farming issues while enhancing sustainable agricultural practices in Malaysia. |
| **C(ii)** | **Detailed proposal of project:**<br>*Cadangan maklumat projek secara terperinci:*<br><br>**(a) Project background including Introduction and Problem Statements**<br>*Keterangan latar belakang projek termasuk pengenalan dan penyataan masalah.*<br><br>*1. Introduction*<br><br>With agriculture still being one of the most impactful sectors of economy and the employment of several Malaysians, it aids in providing food security for the country as well. Facing challenges of debilitating plantar illnesses, the sector is surely being threatened, and the losses that have been recorded are in the billions of Ringgits. Disease detection is very difficult and expensive, and although embarking on a manual inspection of a crop is one strategy, it bypasses most smallholder farmers.<br><br>The growth of AI and the integration of deep learning into various industries is truly remarkable, as it aids in plant pathology. CNNs, being remarkably efficacious in plant disease detection, are one example deep learning can be utilized in agriculture. Li et al. (2021), in their review which has been cited more than 952 times and published in the IEEE Access journal, has proven that CNNs have an accuracy higher that 95% in plant disease classification. Not only that, as demonstrated by Sharma et al. (2020) in the journal, Information Processing in Agriculture, and has more than 460 citations, image segmentation coupled with CNN later classification can reach 98.6% accuracy, which is a tremendous increase and improvement from standard approaches.<br><br>The fusion of powerful smartphones, advanced cloud computing, and complex AI systems provides a unique opportunity to share Agri-knowledge. By building a mobile, intelligent crop disease and pest diagnosis solution, farmers will be able to instantly diagnose and receive identifying information on diseases and pests that could have only been done through expensive consultations or lab tests. This will, in turn, help close Malaysia's agricultural technology gap and advance global sustainable |

agriculture and food security.

We have a robust and foundational dataset, the PlantVillage. Image PlantVillage contains 54,000+ images spanning 38 disease classes. This data has been used to create models that will be able to accurately diagnose different crops and disease stalks. By using transfer learning on systems like ResNet or MobileNet, we will have models that are not only highly accurate but also economically computationally efficient and inexpensive.

*2. Problem Statements*

Plant disease management in Malaysia has numerous challenges, especially in terms of crop productivity, the earnings of farmers, and the food supply of the country:

Problem 1: Detecting the Disease

Most farmers catch plant diseases at a later stage, after the symptoms have already progressed, and at a stage when plant damage is caused, sometimes beyond repair. This is due to a lack of resources and expertise available in rural areas. It is only when farmers and ranchers accept that they are at risk of losing a 30 to 50 percent of their crops is when they realize that, the damage has, in fact, already been caused. New and innovative approaches to managing crop diseases are fundamental for the success of resolving the existing issues in the current market, and they are yet to be discovered.

Problem 2: No Contact with Professional Agricultural Experts

In Malaysia, a plant pathologist and agricultural extension officer is a rare thing to find. The smallholder farmers and rural folks can find them only in 1 to 1000, barring a few exceptions. Guessing and rudimentary forms of pest management are the order of the day, and when they are wrong, more often than not, the blame is placed on the farmers. Misdiagnosis and ineffective treatment are commonplace due to the lack of professionals available to assist with repositories in varying locations.

Problem 3: Inaccurate Manual Inspection

Farmers deploying traditional methods in visual defect detection are highly subjective and prone to human error. Even professional farmers have a difficult time telling some diseases apart or even identifying a disease in its early stages where visual signs are sparse. Literature suggests that the accuracy of manual disease identification is between 60-70 %, leading farmers to applying incorrect treatments and wasting resources or amplifying the spread of the disease. Inadequate diagnostic protocols only worsen the situation by causing inconsistent disease management practices within farming communities.

**(b) Objective (s) of the Project**
*Objektif Projek*

1. Develop Image Preprocessing and Segmentation Module
2. Train and Optimize CNN-Based Disease Detection Model
3. Implement Disease Information and Treatment Recommendation System

**(c) Scope**
*Skop*

The Intelligent Crop Disease Detection System includes and interrelates three different modules focusing on different aspects of the system to maximize its efficiency on disease detection and management. The details of each interrelated module system are:

- Module 1: Image Capture and Preprocessing.

  The image acquisition and the subsequent pre-analysis stage are carried out at this level. The specialization modules perform the system's front-end functionalities and the image preparation as the groundwork for subsequent analysis.

  Key Components:
  - Mobile operated camera functional unit with image guided acquisition.
  - Assessment and validation of image quality.
  - Brightness, contrast, and sharpness adjustments automated devices for image enhancement.
  - Image noise and background suppression.
  - Segmentation of images to detect and isolate the diseased parts of the leaves.
  - Image normalization with subsequent resizing to match input for the model.

- Module 2: Disease Detection Engine

  This module represents the core AI functionality, implementing the deep learning model that performs disease classification and generates confidence scores.

  Key Components:
  - CNN model architecture (transfer learning with ResNet50 or MobileNetV2)
  - Model training pipeline using PlantVillage dataset
  - Data augmentation for improved generalization
  - Model optimization for mobile deployment (quantization, pruning)
  - Inference engine for real-time prediction
  - Confidence score calculation
  - Multi-class classification for 38 disease types
  - Model versioning and update mechanism

- Module 3: Results and Recommendations

  This module presents detection results to users and provides comprehensive disease management information and recommendations.

  Key Components:
  - Results display interface showing disease identification
  - Confidence score visualization
  - Disease information database (symptoms, causes, spread patterns)
  - Treatment recommendations (organic and chemical options)
  - Prevention strategies and best practices
  - Historical tracking of detected diseases
  - Offline disease information access
  - Links to agricultural extension services

1. *Target User*

    - Smallholder farmers
    - Agricultural Extension Officers
    - Commercial Farmers
    - Home Gardeners

**(d) Project Significance**
*Kepentingan projek*

Economic Significance:-

The annual plant disease loss for Malaysia ranges from RM 2-3 billion in which agriculture including rice and vegetables and palm oil and rubber are hit. Advanced plant-disease-detecting systems are capable of estimating of reducing 20-30% crop losses in the farmers and of saving RM 500-2,000 per crop. Adopting these systems aids farmers in rising their profits and if small holder farmers earn profit of RM 1,000-5,000 then this means farmers are earning 10-40% in the value editions. Malaysia has around 300,000 small holder farmers and the economic profit for the farmers is RM 150-600 million in a year.

Reduced Consultation And Travel Expenses: Farmers no longer have to spend money for diagnosing plant diseases such as in consultations which are around RM 100-300. Farmers no longer have to spend 20-50 RM and 4-8 hours as they can spend time by using their phone to plant diseases. This allows farmers to respond to disease problems rapidly.

Reduction in Pesticide Costs: Pesticide overapplication resulting from misdiagnosis of diseases could unnecessarily escalate costs by RM 50-200 per application without yielding measurable benefits. Pursuing proper diagnosis enhances targeted treatment of diseases which in turn lowers additional unwanted purchases of pesticides by 30-40%. For subsistence farmers, this economic benefit is highly valuable.

Market Competitiveness: Improved crop health and reduced disease damage result in higher selling prices, which enhances competitiveness of Malaysian agricultural exports. Costs of crop loss are offset by a greater volume of crop available for sale which leads to a more predictable supply, price stabilization, and improved market power for farmers.

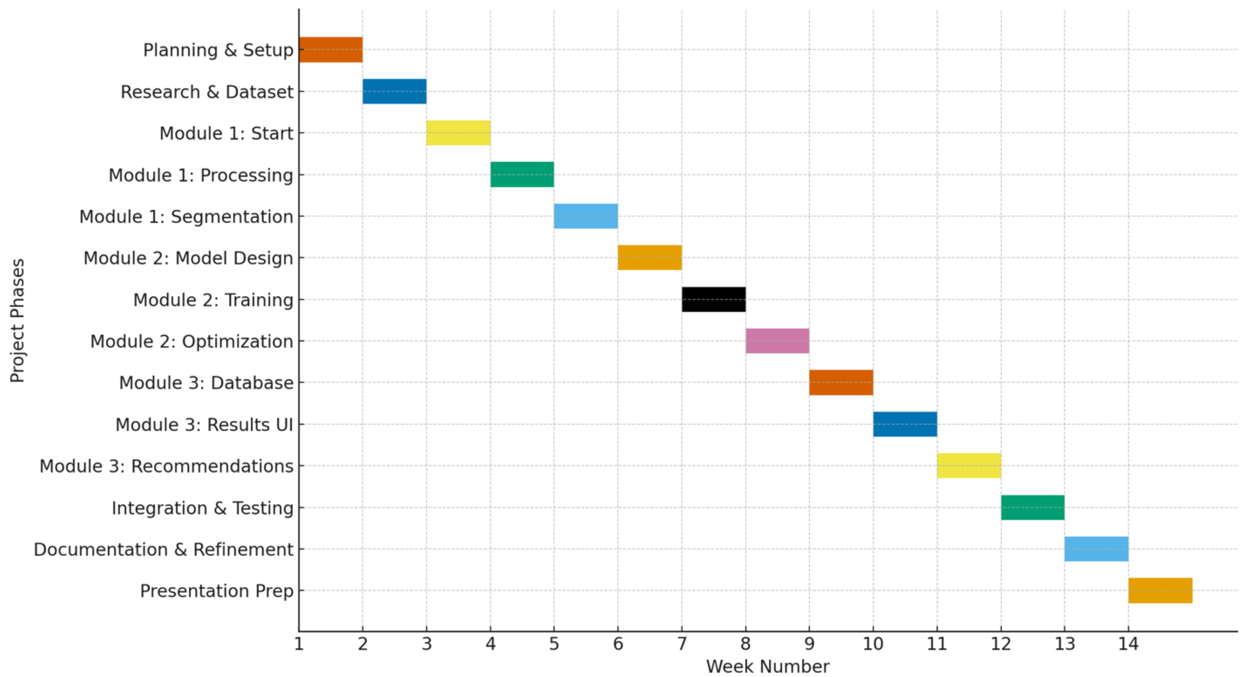
Social Significance:-

Empowerment of Rural Farming Communities: Every farmer with access to a smartphone can attain expert level proficiency in disease diagnostics. This system democratizes agricultural knowledge and services. This level of empowerment is unprecedented for farmers in most disadvantaged and remote areas. Each system can help farmers cut unnecessary consultations with far away specialists and thus enhance their autonomy, confidence and decision-making prowess.
Bridging the Digital Divide: This project is an example of the application of AI for social good. It is designed to help rural areas that have been cut off from the hi-tech world of deep learning. It has been designed for offline and multi-language functionalities that help users with no internet access or language obstacles and thus bridge the rural-urban technological gap.
Gender Equality in Agriculture: Women farmers are the backbone of the Malaysian Agriculture sector, in particular the small holder vegetable and fruit production. The system is user friendly and low cost and thus is able to support women farmers that face greater challenges than men in accessing agricultural extension services. The multi-language capability is a great asset for the foreign workers in the agriculture, thus the system is designed with their inclusion in mind.

Knowledge Transfer and Capacity Building: The system functions as an informative tool beyond the immediate diagnosis and prognosis of the disease by teaching farmers disease identification and treatment methods. The historical tracking functions allows farmers to construct and internalize long-term agricultural knowledge by tracing seasonal patterns and recurring issues. This enhances knowledge and expertise within farming communities.

| | |
|---|---|
| | Food Security for Malaysian Families: The reduction of crop losses directly aids in enhancing the food security of the 32 million citizens in Malaysia. The improvement of agricultural production leads to the more reliable availability of food and subsequently to the lower prices of food and the reduced reliance on food imports such as staple crops like rice and vegetables.<br><br>Environmental Significance:-<br><br>Less Usage of Pesticides: The ‘better safe than sorry’ approach drives farmers to use broad-spectrum pesticides, accurate identification of the disease allows for cutting down the use of pesticides, hence limiting the chemical runoff to the rivers and groundwater which is the case for the agricultural runoff in the water catchment area of the rivers in Malaysia which is a case in region wherein pesticides direct contaminates drinking water used by millions.<br><br>Increase in the Use of Organic Farming Practices: The system as to the primary focus to provide chemical free organic treatment alternatives which also foster the environmentally sound negative agricultural practices. Having historical tracking of the whole process enables farmers to better monitor the organic methods work when they are properly designed and to initiate the organic approaches. This helps expand the sustainable agricultural practices.<br><br>Enhancements in the Protection of the Valuable Pollinators: The use of broad-spectrum pesticides has a negative impact on the other insects and pollinators and the natural pest destructors in agricultural region which is vital for the balanced condition of the ecosystems. This holds a critical importance to overall agricultural sustainability and for the conservation of the biodiversity.<br><br>Adaptation and Mitigation to the Effects of Climate Change: Changes in climate have high chances of bringing new diseases and increased disease pressure making them more aggressive. The farmers will be, in an effortless manner, be able to manage the modified disease territories using his system, which is backed by AI and having the latest disease information. The historical tracking capacity of the system also entails advanced awareness of the emerging disease patterns absolutely to the position exposed due to climate changes.<br><br>Sustainable Resource Management: The targeted treatment strategies described reduce water usage (elimination of unnecessary dilution and application of pesticides), energy use (reduction in the number of tractor trips for spraying), and the volume of packaging waste (reduction in the number of pesticide containers). These combined benefits of Malaysia managed environmentally support the attains commitment towards sustainable development goals. |

**(e) Gantt Chart of Project Activities**
*Carta Gantt Aktiviti Projek*




| D | **ACCESS TO EQUIPMENT AND MATERIAL (IF ANY)** / *KEMUDAHAN SEDIA ADA UNTUK KEGUNAAN BAGI PROJEK INI (SEKIRANYA ADA)* |
|---|---|

| **University**<br>*Universiti* | **Other Sources or Places**<br>*Lain-lain tempat/sumber* |
|---|---|
| ***Software and hardware:***<br><br>*Android Studio,Pycharm,Visual Studio Code,Smartphones,Laptops* | |

| E | **Declaration by student (Group Leader)**/ *Akuan Pelajar (Ketua Kumpulan)* |
|---|---|
| | **Date : 10/10/2025**<br>*Tarikh :*<br><br>**Student's Signature :**<br>*Tandatangan Pelajar :* ______________ |
| F | **Recommendation by the Supervisor**<br>*Perakuan oleh Penyelia* |

**Please tick ( √ ) in the appropriate box**
*Sila tandakan ( √ ) dalam kotak yang berkenaan*

**Recommended:**
*Diperakukan:*

[√] ***A.*** **Highly Recommended**
*Sangat Disokong*

[ ] **B. Recommended**
*Disokong*

[ ] **C. Not Recommended (Please specify reason)**
*Tidak Disokong (Sila Nyatakan Sebab)*

**General Comments:**
*Ulasan umum:* -

**Supervisor's Name:** **Prof Madya. Ts. Dr Mazlan Bin Mohammed**
*Nama Penyelia:*

PROFESOR MADYA Dr. MAZLAN BIN MOHAMED
Profesor Madya
Fakulti Kecerdasan Buatan dan Keselamatan Siber (FAIX)
Universiti Teknikal Malaysia Melaka (UTeM)

**Signature:**
*Tandatangan:* ________________________

**Date: 16/10/2025**
*Tarikh:*

| | |
|---|---|
| **G** | **Comments/ Feedbacks from the Committee of Workshop 2**<br>*Komen/ Maklumbalas daripada Ahli Jawantankuasa Bengkel 2* |
| | |